STANMORE SECONDARY SCHOOL

DATA HANDLING AND STATISTICS

GRADE 10

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MEAN

The mean is most commonly used measure of central tendency. It is commonly known as the average.

$$\text{Mean} = \bar{x} = \frac{\text{sum of the values in the data set}}{\text{number of elements in the data set}}$$

Example : Maths test marks for 16 learners

67, 78, 21, 42, 80, 71, 33, 99, 78, 46, 98, 96, 22, 98, 43, 46

$$\text{mean} = \bar{x} = \frac{67+78+21+42+80+71+33+99+78+46+98+96+22+98+43+46}{16}$$

$$\text{mean} = \bar{x} = \underline{63,63} \text{ marks}$$

The average marks is $\underline{63,63 \text{ marks}}$

MEDIAN

The median is the middle value of an ordered data set. When determining the median of a data set the data must always be divided. The median divides a data set in half.

Example :

1, 5, 6, 2, 9, 16, 10

Arrange the data in order

1, 2, 5, 6, 9, 10, 16

The middle data

1, 2, 5, [6], 9, 10, 16

Position of median = $\dfrac{n+1}{2}$

Median for the above data set is equal to $\underline{6}$

Quartiles

Quartiles subdivide a data set into quaters (4 groups)
There are 3 quartiles

Lower quartile (Q_1): The median of the lower half of the values in the data set

The median (Q_2): The middle value of the data set.

The upper quartile (Q_3): The median of the upper half of the values in the data set.

Example: 7 learners marks in a maths test.

75; 95; 60; 82; 52; 78; 50

Step 1) Arrange data in order.

50; 52; 60; 75; 78; 82; 95

Step 2) Determine the median (Q_2)

50; 52; 60; $\boxed{75}$; 78; 82; 95

Step 3) Determine the lower quartiles (Q_1)

50; $\boxed{52}$; 60; 75; 78; 82; 95.

Step 4) Determine the upper quartiles (Q_3)

50; 52; 60, 75; 78, $\boxed{82}$; 95

$\therefore Q_1 = 52$; $Q_2 = 75$; $Q_3 = 82$

median

INTERQUARTILE RANGE

The interquartile range (IQR) is the difference between the lower and upper quartile.

$$IQR = Q_3 - Q_1 \Rightarrow 82 - 52 = 30$$

$$\therefore IQR = 30$$

PERCENTILES

Percentiles divide a data set into intervals, such as deciles or hundredths. The percentiles tell you what percentage of data lies below and above a specific data point in a data set. In other words, if a data point is in the 80th percentile, it means that 80% of the data is equal to or below that value and that 20% of the data lies above it.

Percentiles:

$$\text{Position of Percentile} = \frac{\text{Percentile}}{100} \times \text{number of values in data set}$$

Steps to calculating percentiles

1. Write the data in order.
2. Determine the position of the percentile asked for using the above formula.
3. Determine the actual value of the percentile by counting up the ordered data set.

Example 1: Determine the 30th and 65th percentiles of the data set below.

18	12	5	32	22	20	24	26	25	29

Step 1) Write the data in order

5, 12, 18, 20, 22, 24, 25, 26, 29, 32

Step 2) Determine the position of the 30th and 65th percentiles:

$$\text{Position} = \frac{\text{Percentile}}{100} \times \text{Number of values in data set}$$

30th percentile: $\text{Position} = \frac{30}{100} \times 10$

$$= 3$$

65th percentile: $\text{Position} = \frac{65}{100} \times 10$

$$= 6.5$$

$$\approx 7 \rightarrow \text{round off to the nearest integer}$$

Step 3) Determine the actual value of the percentile:

5, 12, 18 (3rd position), 20, 22, 24, 25 (7th position), 26, 29, 32

This means that 30% of the data values are less than or equal to 18 and that 65% of the data values are less than or equal to 25.

D. THE FIVE NUMBER SUMMARY

The different measures of dispersion that you have learnt so far can be represented and analysed graphically on a box and whisker diagram using the Five Number Summary. The five number summary is:

1) Lowest value in the data set.
The first of the five number summary, is the lowest (minimum) value in the ordered data set.

2) Lower Quartile / First Quartile / 25th percentile (Q_1).
The lower quartile is the median of the lower half of the ordered data set.

3) Median / Second Quartile / 50th percentile (Q_2).
The median is the middle value in an ordered set of data. If there is an even number of terms, the median will be the sum of the two terms in the middle divided by two.

4) Upper Quartile / Third Quartile / 75th percentile (Q_3).
The upper quartile is the median of the upper half of the ordered data set.

5) Highest value in the data set.
The last of the five number summary, is the highest (maximum) value in the ordered data set.

BOX AND WHISKER DIAGRAMS

A box and whisker plot is a graphical representation of the Five Number summary. A box and whisker plot can assist in analysing the spread of data about the median.
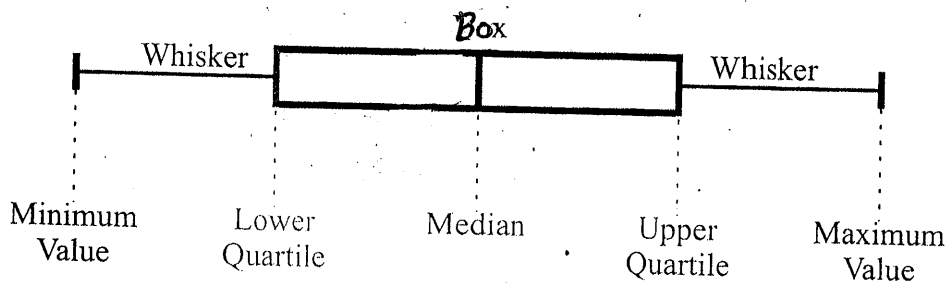
WORKING WITH GROUPED DATA

In grade 10 you are required to be able to identify the intervals in which the lower quartile, median, upper quartile and any percentile lies in grouped data. In addition you are required to calculate the approximate mean for grouped data. Grouped data is data that is arranged in groups or classes rather than showing individual figures. 😊

Example: The following table shows the percentage that 200 Grade 10 learners obtained in an exam.

Percentage Obtained (x)	Number of Learners
$0 < x \leq 20$	4
$20 < x \leq 40$	47
$40 < x \leq 60$	79
$60 < x \leq 80$	50
$80 < x \leq 100$	20

a) Determine the interval in which the median lies.
b) Determine the interval in which the lower quartile lies.
c) Determine the interval in which the upper quartile lies.
d) Determine the interval in which the 40th percentile lies.
e) Determine the approximate mean percentage of the examination.

When determining in which interval quartiles and percentiles lie within grouped data, you have to add in a cumulative frequency column.

Percentage Obtained	Number of Learners	Cumulative Frequency
$0 < x \leq 20$	4	4
$20 < x \leq 40$	47	51 → (4+57)
$40 < x \leq 60$	79	130 → (51+79)
$60 < x \leq 80$	50	180 → (130+150)
$80 < x \leq 100$	19	199 → (180+19)

a) The position of the **median** learner is at $\dfrac{n+1}{2}$ (see page 193) :

$$\text{median position} = \frac{199+1}{2} = 100$$

∴ the 100th learner is in the median position.

From the table and cumulative frequency it can be seen that there are 51 learners up to the interval of $20 < x \leq 40$ and 130 learners in the interval up to $40 < x \leq 60$.

∴ the median $\left(100^{th} \text{ learner}\right)$ must lie in the interval of $40 < x \leq 60$.

b) The position of the **lower quartile** learner is the median of the lower half of the data. As the median is in position 100 there are 99 learner in the lower half.

∴ position of lower quartile $= \dfrac{99+1}{2} = 50$

∴ the 50th learner is in the lower quartile position.

From the table and cumulative frequency it can be seen that there are 4 learners up to the interval of $0 < x \leq 20$ and 51 learners in the interval up to $20 < x \leq 40$.

∴ the lower quartile $\left(50^{th} \text{ learner}\right)$ must lie in the interval of $20 < x \leq 40$.

c) The position of the **upper quartile** learner is the median of the upper half of the data. As the median is in position 100 there are 99 learner in the upper half.

$$\therefore \text{ position of upper quartile} = 100 + \frac{99+1}{2} = 150$$

$\therefore$ the 150th learner is in the upper quartile position.

From the table and cumulative frequency it can be seen that there are 130 learners up to the interval of $40 < x \leq 60$ and 180 learners in the interval up to $60 < x \leq 80$.

$\therefore$ the upper quartile $\left(150^{th} \text{ learner}\right)$ must lie in the interval of $60 < x \leq 80$.

d) Calculate the position of the 40th percentile

$$\text{Position} = \frac{40}{100} \times 200 = 80 \rightarrow 40\% = \frac{40}{100} \text{ , there are 200 learners in the data set}$$

$\therefore$ the 40th percentile is the 80th learner

$\therefore$ the 40th percentile lies in the interval of $40 < x \leq 60$.

e) The mean percentage of the data is the total percentage obtained by all the learners divided by the number of learners. As you don't know the exact percentage obtained by the learners you can assume that each learner obtained the middle value of each interval. In order to calculate the mean you draw up a new table as shown below:

Percentage Obtained	Number of Learners	Midpoint of interval	Learners × Midpoint
$0 < x \leq 20$	4	10	40
$20 < x \leq 40$	47	30	1410
$40 < x \leq 60$	79	50	3950
$60 < x \leq 80$	50	70	3500
$80 < x \leq 100$	20	90	1800
Sum			**10700**

$$\text{approximate mean} = \frac{10\,700}{200} = 53.5\%$$

When working with grouped data, if you are asked for the value of the median, lower, upper quartile or percentile, the approximate value will be the midpoint of the interval.

- So for the above example the values of the:
- **Lower quartile** would be 30
- **Median** would be 50
- **Upper quartile** would be 70
- **40th percentile** would be 50

STATISTICS

PROCEDURE TO FOLLOW TO DETERMINE MEAN, AND STANDARD DEVIATION

	Button to press/method	Calculator display
1	Mode	A list of various modes
2	2 (STAT)	A list of options in STAT mode
3	1 (1–VAR)	A table to input values
4	Input each data value one at a time, pressing the = button after each entry.	
5	Once all the data is entered press AC	0
6	Shift 1 (STAT)	A list of options to choose
7	4 (Var)	1: n 2: $\bar{x}$ 3: σx 4: sx
8	Pressing 1 will display the number of data entries. Pressing 2 will display the mean and pressing 3 will display the standard deviation. (option 4 will not be used)	
9	2 ($\bar{x}$) and then =	67,55
10	To determine the standard deviation repeat steps 6,7 and 8 pressing 3 instead of 2	
11	3 (σx) and then =	15,75

12   6 MIN AND MAX   1. MIN   2 MAX
                               3 MED   4 Q1
                               5. Q3

EXAMPLE   The table below shows the percentage distribution of the South African population by province in 2010.

EC	FS	Gauteng	KZN	Limpopo	Mpumalanga	NC	NW	WC
14	6	22	21	11	7	2	6	11

a) Determine the five number summary for the data in the table.
b) Draw a box and whisker plot for the data.
c) Are there any outliers in the data?

a) You always have to write the data in order when dealing with a 5 number summary.

2	6	6	7	11	11	14	21	22

Minimum Value: 2

Median: Position $= \dfrac{n+1}{2} = \dfrac{9+1}{2} = 5 \therefore 11$ is the median
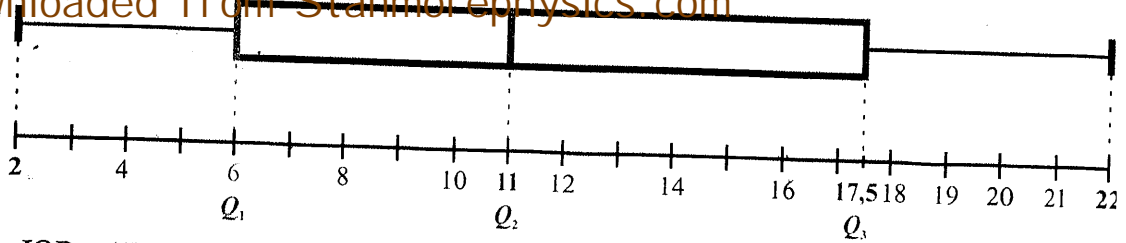
Lower Quartile: Position $= \dfrac{n+1}{2} = \dfrac{4+1}{2} = 2,5 \therefore \dfrac{6+6}{2} = 6$ is the lower quartile

Upper Quartile: Position $=$ median position $+ 2,5 = 5 + 2,5 = 7,5$

$\therefore \dfrac{14+21}{2} = 17,5$ is the upper quartile

Maximum Value: 22

c) $\text{IQR} = 17,5 - 6 = 11,5$

$Q_1 - (1,5 \times \text{IQR}) = 6 - (1,5 \times 11,5) = -11,25$

$Q_3 + (1,5 \times \text{IQR}) = 17,5 + (1,5 \times 11,5) = 34,75$

There are no values less than $-11,5$ or greater than $34,75$. Therefore, there are no outliers in the data set.

EXAMPLE OF DETERMINING OF OGIVE CURVE

Distance (d)	Frequency	Cumulative Frequency
$2 \leq d < 3$	5	5
$3 \leq d < 4$	10	$15 \to 5 + 10$
$4 \leq d < 5$	35	$50 \to 15 + 35$
$5 \leq d < 6$	40	$90 \to 50 + 40$
$6 \leq d < 7$	20	$110 \to 90 + 20$
$7 \leq d < 8$	10	$120 \to 110 + 10$
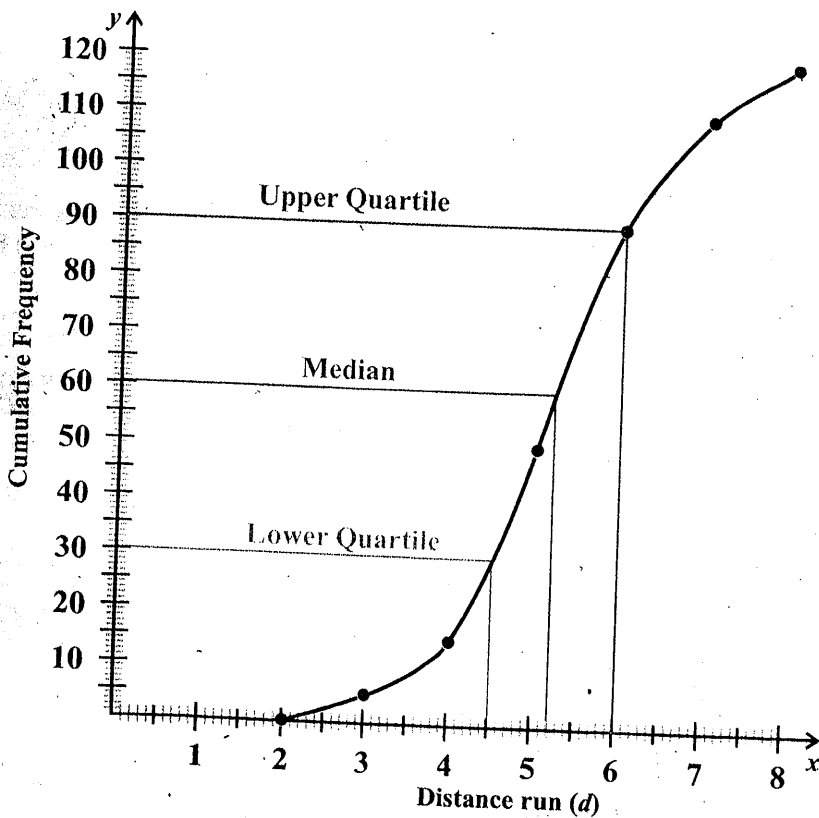
Lower quartile position: $120 \times \dfrac{1}{4} = 30$

$\therefore$ lower quartile $= 4,5\,\text{km}$ (read off the graph)

Median position: $120 \times \dfrac{1}{2} = 60$

$\therefore$ median $= 5,2\,\text{km}$ (read off the graph)

Upper quartile position: $120 \times \dfrac{3}{4} = 90$

$\therefore$ upper quartile $= 6\,\text{km}$ (read off the graph)

You can now calculate the inter-quartile range:

Inter-quartile range $= Q_3 - Q_1 = 6 - 4,5 = 1,5\,\text{km}$

The *x*-values are the actual lower quartile, median, and upper quartile times.

∴ Calculate the *y*-value of the lower quartile, median and upper quartile

Lower quartile position: $172 \times \dfrac{1}{4} = 43$

∴ lower quartile $= 30$ (read off the graph)

Median position: $172 \times \dfrac{1}{2} = 86$

∴ median $= 46$ (read off the graph)

Upper quartile position: $172 \times \dfrac{3}{4} = 129$

∴ upper quartile $= 62$ (read off the graph)

ESTIMATED MEAN

Time	Frequency (f)	Midpoint (x)	Frequency x midpoint ($f.x$)
$0 \leq T < 20$	21	10	210
$20 \leq T < 40$	48	30	1440
$40 \leq T < 60$	56	50	2800
$60 \leq T < 80$	32	70	2240
$80 \leq T < 100$	10	90	900
$100 \leq T < 120$	5	110	550
Sum	$\sum f = 172$		$\sum f.x = 8140$

∴ Estimated mean $= \dfrac{8140}{172} \rightarrow \dfrac{\sum f.x}{\sum f}$

∴ $\bar{x} = 47$ minutes

> Do not get confused between the MEAN and the MEDIAN. The mean is the average value of a data set, while the median is the middle value in an ordered set of data.

> In order to determine the exact position of the median the formula shown below should be used. However, when working with ogives it is considered accurate enough to divide the cumulative frequency by 2.
>
> $$\text{Position of median} = \dfrac{n+1}{2}$$

PAST YEAR

PAPERS

QUESTIONS

&

ANSWERS

QUESTION 1

1.1　The following mathematics test marks were recorded for a Grade 10A class of 28 students.

MARKS	FREQUENCY	MIDPOINTS	MIDPOINT × FREQUENCY
$0 < x \leq 30$	2	15	30
$30 < x \leq 40$	3	35	105
$40 < x \leq 50$	11	45	495
$50 < x \leq 60$	7	55	
$60 < x \leq 70$	3		195
$70 < x \leq 80$	2	75	150
$80 < x \leq 100$	0	90	0

1.1.1　Complete the table above by filling in the two missing numbers. (2)

1.1.2　Calculate an estimate of the mean mark. (2)

1.1.3　Represent the data on a frequency polygon. (3)

1.1.4　In which interval does the

　　(a)　median lie? (2)

　　(b)　80th percentile lie? (2)

1.2　The following Mathematics test marks of a Grade 10B class are recorded below:

45	49	50	51	51	53	54	57	57	59	60	64
65	66	70	71	73	74	75	76	83	89	89	

1.2.1　Write down the median mark for this class. (1)

1.2.2　Calculate the interquartile range mark for this class. (3)

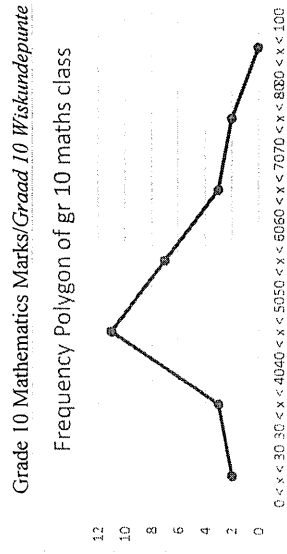1.2.3　Represent the data on a box and whisker diagram. (3)

1.2.4　Comment on the distribution of the data with reference to the box and whisker diagram. (2)

[20]

QUESTION 1/VRAAG 1

1.1

Marks/Punte	Frequency/Frekwensie	Midpoints/Middelpt	Midpoint × Frequency/Middelpt × Frekwensie	
$0 < x \leq 30$	2	15	30	
$30 < x \leq 40$	3	35	105	
$40 < x \leq 50$	11	45	495	
$50 < x \leq 60$	7	55	**385**	✓ 385
$60 < x \leq 70$	3	65	195	✓ 65
$70 < x \leq 80$	2	75	150	
$80 < x \leq 100$	0	90	0	
	28		1360	

(2)

1.1.2

Estimate of the mean/*Benaderde gemiddelde* $= \dfrac{1360}{28}$

$= 48,6$

✓ 1360
✓ 48,6

(2)

1.1.3

Grade 10 Mathematics Marks/*Graad 10 Wiskundepunte*

Frequency Polygon of gr 10 maths class

✓✓ mdpts / *middelpunte*

Line joining midpoints / *Lyn verbind middelpunte*

(3)

1.1.4 (a)

$40 < x \leq 50$

✓ Endpoint / *Eindpunt*
✓ Notation / *Notasie*

(2)

1.1.4 (b)

$50 < x \leq 60$

2,4
✓ 22,4
✓ Interval / *Interval*

(2)

1.2

45	49	50	51	51	53	54	57	57	59	60	64
65	66	70	71	73	74	75	76	83	89	89	

✓ answer / *antwoord*

(1)

1.2.1

Median = 64

1.2.2

IQR $= Q_3 - Q_1$
$= 74 - 53$
$= 21$

✓ Q_3
✓ Q_1
✓ answer / *antwoord*

(3)

1.2.3

✓ Min./Min. Max./Maks.
✓ Q_1
✓ Q_3
✓ Q_2
✓ answer / *antwoord*

(3)

1.2.4
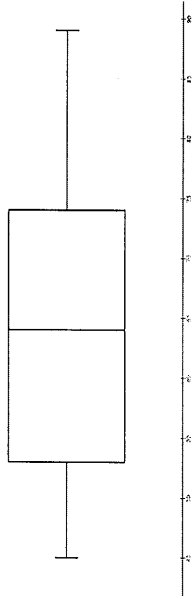
Skewed to the left / *Skeef na links*

✓✓

(2)

[20]

QUESTION 1

1.1 A tuck shop at a particular school sells soft drink cans. The economicfriendly club of this school collected soft drink cans for recycling for a period of 20 days. The number of cans collected was recorded and the data is given below:

48	50	52	59	60	68	73	76	76	76
78	79	80	81	82	82	84	91	92	98

1.1.1 Determine the median of the cans collected. (1)

1.1.2 Determine the value of the upper and lower quartiles. (2)

1.1.3 Calculate the interquartile (IQR) range of the data. (2)

1.1.4 Write down the minimum and maximum value of the data. (1)

1.1.5 Represent the 5 number summary on a box and whisker diagram. (3)

1.1.6 Comment on the box and whisker diagram. (1)

1.2 Telkom conducted a survey regarding the duration of telephone calls made by people in a certain community. The information was then tabulated as indicated below:

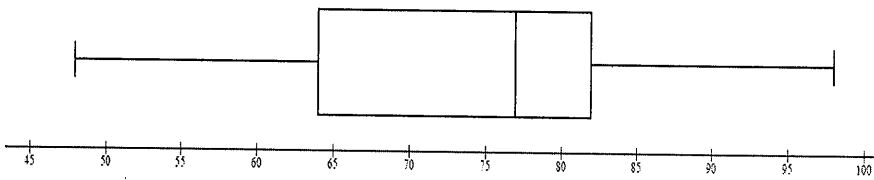| Duration (min)	No of calls (f_1)	Midpoint (x_1)	(f_1)×(x_1)
$2 \leq t < 5$	47	3,5	164,5
$5 \leq t < 8$	139	6,5	903,5
$8 \leq t < 11$	211	9,5	2004,5
$11 \leq t < 14$	102	12,5	1275
$14 \leq t < 17$	58	15,5	899
$17 \leq t < 20$	19	**A**	**B**

1.2.1 Calculate the values of **A** and **B**. (2)

1.2.2 Determine the approximate mean for the duration of the telephone calls. (3)

1.2.3 In which interval does the 75thpercentile lie? (2)

[17]

Consistent accuracy (CA) marking, applies in ALL aspects of the marking guideline.

QUESTION 1

48	50	52	59	60	68	73	76	76	76
78	79	80	81	82	82	84	91	92	98

1.1.1	Median $= \dfrac{76 + 78}{2} = 77$	✓ answer (1)
1.1.2	Lower quartile $= \dfrac{60 + 68}{2} = 64$ Upper quartile $= 82$	✓ lower quartile ✓ upper quartile (2)
1.1.3	Interquartile range (IQR) $= Q_3 - Q_1$ $\qquad\qquad = 82 - 64 = 18$	✓ substitution ✓ answer (2)
1.1.4	Min $= 48$ and max $= 98$	✓ min and max (1)
1.1.5		✓ min and max ✓ Q_1 and Q_3 ✓ Q_2 (3)
1.1.6	Skewed to the left or negatively skewed	✓ answer (1)

1.2	Duration (min)	No of calls (f_1)	Midpoint (x_1)	(f_1) × (x_1)	
	$2 \le t < 5$	47	3,5	164,5	
	$5 \le t < 8$	139	6,5	903,5	
	$8 \le t < 11$	211	9,5	2004,5	
	$11 \le t < 14$	102	12,5	1275	
	$14 \le t < 17$	58	15,5	899	
	$17 \le t < 20$	19	**A**	**B**	
		576		5598	

1.2.1	**A** $= 18,5$ and **B** $= 351,5$	✓ answer of A ✓ answer of B (2)
1.2.2	approximate mean $= \dfrac{sum\,of\,f_1 \times x_1}{sum\,of\,f_1}$ $\qquad\qquad = \dfrac{5598}{576}$ $\qquad\qquad = 9,7$ minutes	✓ sum of all $(f_1) \times (x_1)$ ✓ sum of all (f_1) ✓ answer (3)
1.2.3	75th percentile lie $= \dfrac{75}{100} \times 576 = 432$ In the interval $11 \le t < 14$	✓ 432 ✓ interval (2)
[17]		

QUESTION 1

The line graph below shows test marks out of 10 obtained by a Grade 10 class.
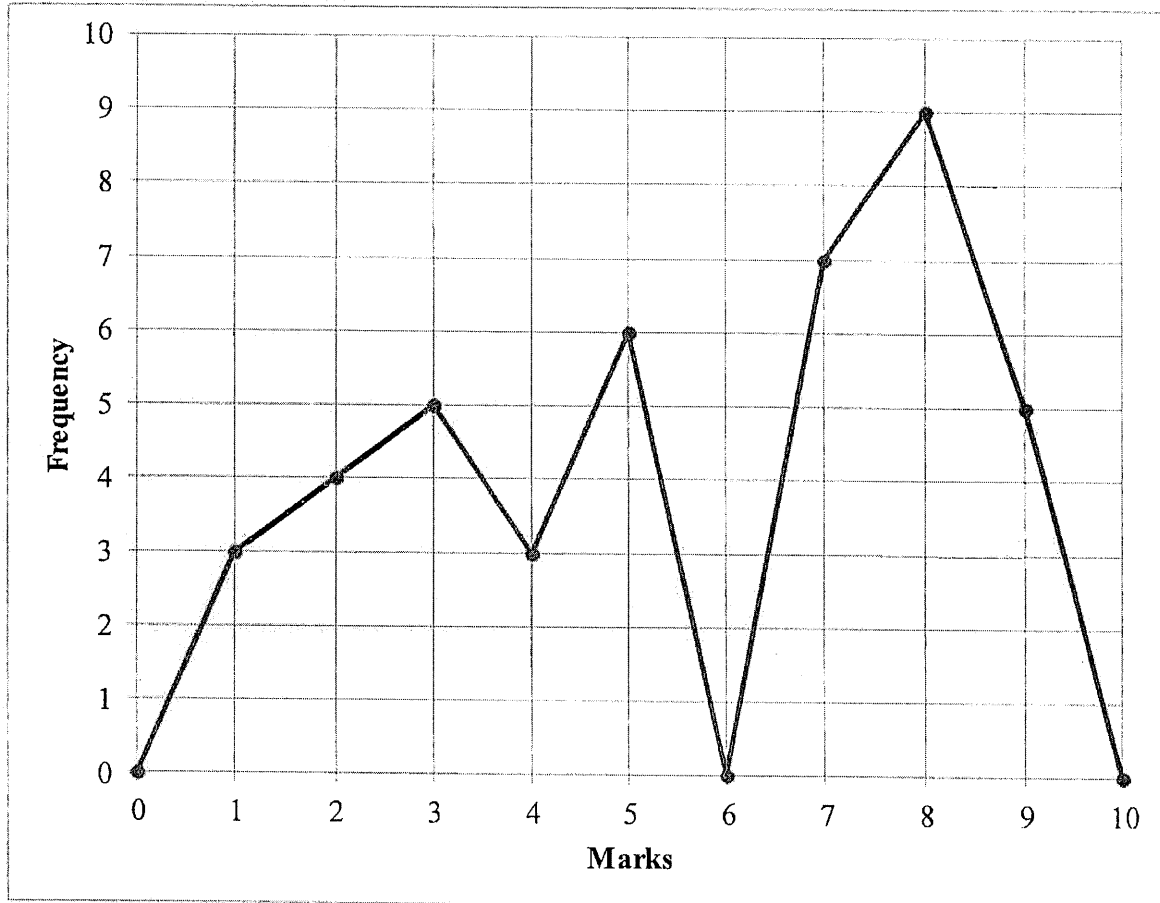
1.1   Complete the frequency column in the table provided in the ANSWER BOOK.   (2)

1.2   How many learners wrote the test?   (1)

1.3   Calculate the:

        1.3.1   Range for the data   (2)

        1.3.2   Mean for the test   (3)

1.4   Determine the median for the data.   (3)

1.5   Draw a box and whisker diagram for the data.   (3)
                                                                                [14]

NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

1.1			

Marks/*Punte*	Frequency/*Frekwensie*
0	0
1	3
2	4
3	5
4	3
5	6
6	0
7	7
8	9
9	5
10	0

2 marks:
all 11 values correct

1 mark:
5 – 10 values correct

0 marks:
0 – 4 values correct
(2)

1.2	42 learners/*leerders*	✓answer/*antwoord* (1)

1.3.1	Range/*Variasiewydte* $= 9 - 1$ $= 8$ — Answer only: 2/2 marks	✓ max = 9 and min = 1 ✓ answer/*antwoord* (2)

1.3.2

$$\bar{x} = \frac{(1\times 3)+(2\times 4)+(3\times 5)+(4\times 3)+(5\times 6)+(7\times 7)+(8\times 9)+(9\times 5)}{42}$$

$$= \frac{234}{42}$$

$$= 5,57$$ Answer only: 3/3 marks

✓ sum of (frequencies × values)

✓ ÷ n
✓ answer/*antwoord*
(3)

1.4

Position of the median/*Posisie van die mediaan* $= \dfrac{n+1}{2}$

$= 21,5^{\text{th/de}}$ position/*posisie*

$Q_2 = \dfrac{5+7}{2}$

$= 6$ Answer only: 3/3 marks

✓ identification of 5 and 7

✓ $\dfrac{5+7}{2}$

✓ answer/*antwoord*
(3)

1.5

✓ Q_1
✓ Q_3
✓ rest of the box
(3)

[14]

QUESTION 1

The data below shows the number of laptops sold by 15 sales agents during the last financial year.

43   48   62   52   46   90   58   37   48   73   84   68   54   34   78

1.1   Determine the median of the number of laptops sold.   (2)

1.2   Calculate the range of the data.   (2)

1.3   Calculate the interquartile range (IQR).   (3)

1.4   Draw a box and whisker diagram for the data above.   (3)
                                                                                              [10]

QUESTION 2

A learner did a project on climate change. At 14:00 each day, she recorded the temperature (in °C) for a certain town. The information is given in the frequency table below.

TEMPERATURE (IN °C)	FREQUENCY
$20 \leq T < 24$	2
$24 \leq T < 28$	4
$28 \leq T < 32$	9
$32 \leq T < 36$	5
$36 \leq T < 40$	7
$40 \leq T < 44$	3

2.1   For how many days did the learner collect the data?   (1)

2.2   Write down the modal class for the data.   (1)

2.3   Estimate the mean of the data.   (3)

2.4   Calculate the percentage of days on which the temperature was at least 28 °C.   (2)
                                                                                              [7]
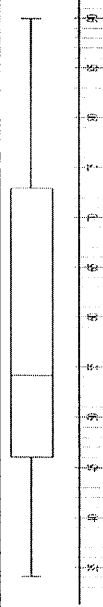
NOTE:
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- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar dat waardes/antwoorde veronderstel word om 'n probleem op te los.*

QUESTION/VRAAG 1

1.1	Median/*Mediaan* = 54	$\checkmark\checkmark$ answ./*antw.*	(2)
1.2	Range/*Variasiewydte* $= 90 - 34 = 56$	$\checkmark$ answ./*antw.*	(2)
1.3	IQR(IKV) $= Q_3 - Q_1$ $= 73 - 46$ $= 27$	$\checkmark Q_1 = 46$ $\checkmark Q_3 = 73$ $\checkmark$ answ./*antw.*	(3)
1.4		$\checkmark$ min. & max./*maks.* $\checkmark$ median/*mediaan* (Q$_2$) $\checkmark$ Q$_1$ and/*en* Q$_3$	(3)
			[10]

QUESTION/VRAAG 2

2.1	30 days/*dae*	$\checkmark$ answ./*antw.*	(1)
2.2	$28 \leq T < 32$	$\checkmark$ answ./*antw.*	(1)
2.3	The mean/*Gemiddeld* $(\overline{X}) = \dfrac{44 + 104 + 270 + 170 + 266 + 126}{30}$ $= \dfrac{980}{30}$ $= 32,666$ $= 32,67°\text{C}.$	$\checkmark$ addition/*optel* $\checkmark 30$ $\checkmark$ answ./*antw.*	(3)
2.4	$9 + 5 + 7 + 3 = 24$ days/*dae* % of number of days/*getal dae* $= \dfrac{24}{30} \times 100$ $= 80\%$	$\checkmark$ addition/*optel* $\checkmark$ answ./*antw.*	(2)
			[7]

QUESTION/VRAAG 3

3.1	$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(7-6)^2 + (4-6)^2}$ $= \sqrt{(1)^2 + (-2)^2}$ $= \sqrt{5}$	$\checkmark$ subst./*verv.* $\checkmark$ answ./*antw.*	(2)
3.2	$M_{QS} = T(x;y)$ $\left(\dfrac{6+x}{2}; \dfrac{6+y}{2}\right) = \left(\dfrac{7}{2}; \dfrac{7}{2}\right)$ $\dfrac{6+x}{2} = \dfrac{7}{2}$ $\dfrac{6+y}{2} = \dfrac{7}{2}$ $x = 1$ $y = 1$ $S(1;1)$	$\checkmark \dfrac{6+x}{2} = \dfrac{7}{2}$ $\checkmark \dfrac{6+y}{2} = \dfrac{7}{2}$ $\checkmark$ answ./*antw.*	(3)

NOVEMBER 2016

QUESTION 1

The heights of 20 children were measured (in centimetres) and the results were recorded. The data collected is given in the table below.

127	128	129	130	131	133	134	134	135	136
137	138	139	140	141	142	142	143	144	145

1.1 Write down the median height measured. (1)

1.2 Determine:

      1.2.1 The mean height (2)

      1.2.2 The range (1)

      1.2.3 The interquartile range (3)

1.3 Draw a box and whisker diagram to represent the data. (2)

[9]

QUESTION 2

The intelligence quotient score (IQ) of a Grade 10 class is summarised in the table below.

IQ INTERVAL	FREQUENCY
$90 \leq x < 100$	4
$100 \leq x < 110$	8
$110 \leq x < 120$	7
$120 \leq x < 130$	5
$130 \leq x < 140$	4
$140 \leq x < 150$	2

2.1 Write down the modal class of the data. (1)

2.2 Determine the interval in which the median lies. (2)

2.3 Estimate the mean IQ score of this class of learners. (3)
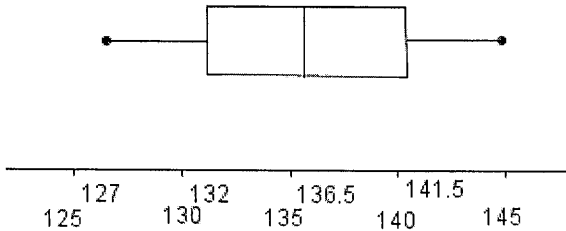
[6]

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- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION 1/*VRAAG 1*

1.1	Median/*Mediaan* $= \dfrac{136+137}{2}$ $= 136,5$	✓ answer/*antwoord* (1)
1.2.1	Mean/*Gemiddelde* $= \dfrac{2728}{20}$ $= 136,4$ cm	✓ $\dfrac{2728}{20}$ ✓ answer/*antwoord* (2)
1.2.2	Range/*Variasiewydte* $= 145 - 127$ $= 18$ cm	✓ answer/*antwoord* (1)
1.2.3	Lower quartile/*Onderste kwartiel* $= 132$ Upper quartile/*Boonste kwartiel* $= 141\frac{1}{2}$ Interquartile range/*IKO* $= 141\frac{1}{2} - 132$ $= 9,5$ cm	✓ Lower quartile/*Onderste kwartiel* ✓ Upper quartile/*Boonste kwartiel* ✓ answer/*antwoord* (3)
1.3	 127 132 136.5 141.5 125 130 135 140 145	✓ median/min/max/ *mediaan/min/mak* ✓ Q_1 and/ *en* Q_3 (2) **[9]**

QUESTION 2/VRAAG 2

2.1	Modal class(*Module klas*) $100 \le x < 110$	✓ answer/*antwoord* (1)
2.2	$110 \le x < 120$	✓✓answer/*antwoord* (2)
2.3	Estimate Mean IQ of students/*Geskatte gemiddelde IK* $= \dfrac{3480}{30}$ $= 116$	✓ 3480 ✓ 30 ✓ answer/*antwoord* (3) **[6]**

QUESTION 3/VRAAG 3

3.1	$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(3-1)^2 + (6-1)^2}$ $= \sqrt{29}$ $AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $= \sqrt{(6-1)^2 + (3-1)^2}$ $= \sqrt{29}$ $\qquad AB = AC$ ∴ ΔABC is isosceles/*gelykbenig*	✓subst. in corr. formula/*vervang in korrekte formule* ✓ distance/*afstand* AB ✓subst. in corr. formula/*vervang in korrekte formule* ✓AB = AC (4)
3.2.1	AD is parallel to the *x*-axis/*AD parallel aan x-as* ∴ A and D have the same *y*-coordinates/*A en D het dieselfde y-koördinate* but AD = 5 units/*eenhede* ∴ D(8 ; 5) CD is perpendicular to the *x*-axis/*CD is loodreg met x-as* ∴ C and D have the same *x*-coordinate/*C en D het dieselfde x-koördinate* But C lies on the *x*-axis./*C lê op x-as* ∴ C(8 ;0)	✓coordinates D/ *koördinate D* ✓ coordinates C/ *koördinate C* (2)

Please turn over/*Blaai om asseblief*

QUESTION 1

Nineteen girls were required to complete a puzzle as quickly as possible. Their times (in seconds) were recorded and are shown in the table below.

14	15	16	16	17	17	18	18	19	19
19	20	21	21	22	23	24	24	29	

1.1   Identify the median time taken by the girls to complete the puzzle.   (1)

1.2   Determine the lower and upper quartiles for the data.   (2)

1.3   Draw a box and whisker diagram to represent the data.   (2)

1.4   The five-number summary of the time (in seconds) taken by 19 boys to complete the same puzzle is (15 ; 19 ; 23 ; 26 ; 30).

       1.4.1   Calculate the interquartile range for the time taken by the boys.   (2)

       1.4.2   If only one boy took 19 seconds to complete the puzzle, what percentage of the boys took at least 19 seconds to complete the puzzle?   (1)

1.5   In which group, the girls or the boys, did a larger number of learners complete the puzzle in less than 23 seconds? Justify your answer.   (2)
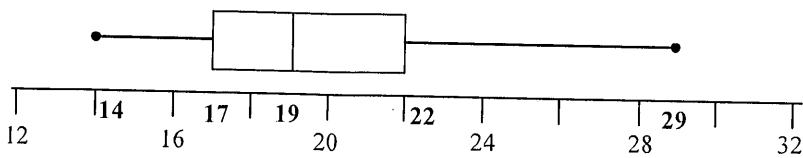
[10]

QUESTION 2

The table below shows information about the number of hours 120 learners spent on their cellphones in the last week.

NUMBER OF HOURS (h)	FREQUENCY
$0 < h \leq 2$	10
$2 < h \leq 4$	15
$4 < h \leq 6$	30
$6 < h \leq 8$	35
$8 < h \leq 10$	25
$10 < h \leq 12$	5

2.1   Identify the modal class for the data.   (1)

2.2   Estimate the mean number of hours that these learners spent on their cellphones in the last week.   (3)

[4]

14	15	16	16	17	17	18	18	19	19
19	20	21	21	22	23	24	24	29	

1.1	Median/*Mediaan* = 19 seconds/*sekondes*	✓ answer/*antw* (1)
1.2	Lower quartile/*Onderste kwartiel* (Q₁) = 17 Upper quartile/*Boonste kwartiel* (Q₃) = 22	✓ Q_1 ✓ Q_3 (2)
1.3		✓ box/*mond* ✓ whiskers/*snor* (2)
1.4.1	IQR/*IKO* = 26 − 19 = 7	✓ $Q_3 - Q_1$ ✓ answer/*antw* (2)
1.4.2	75% of the boys took at least 19 seconds to complete the puzzle./ *75% van die seuns het ten minste 19 sekondes geneem om die legkaart te voltooi.*	✓ 75% (1)
1.5	About 50% but not more than 75% of the boys completed the puzzle in less than 23 seconds./*Ongeveer 50% maar nie meer as 75% van die seuns het die legkaart in minder as 23 sekondes voltooi.* More than 75% of the girls completed the puzzle in less than 23 seconds./*Meer as 75% van die dogters het die legkaart in minder as 23 sekondes voltooi.* Therefore more girls completed the puzzle in less than 23 seconds./*Meer dogters het dus die legkaart in minder as 23 sekondes voltooi.*	✓ relevant/*relevante* explanation/*verduideliking* ✓ girls/*dogters* (2) **[10]**

QUESTION/*VRAAG* 2

NUMBER OF HOURS *GETAL UUR (h)*	FREQUENCY *FREKWENSIE*
$0 < h \le 2$	10
$2 < h \le 4$	15
$4 < h \le 6$	30
$6 < h \le 8$	35
$8 < h \le 10$	25
$10 < h \le 12$	5

2.1	The modal class is/*Die modale klas is* $6 < h \le 8$	✓ $6 < h \le 8$ (1)
2.2	Average/*Gemiddelde* $= \dfrac{1 \times 10 + 3 \times 15 + \ .... \ + 11 \times 5}{120}$ Estimated mean/*Geskatte gemiddelde* ($\bar{x}$) $= \dfrac{730}{120}$ $= 6{,}08$ hours/*uur*	✓ midpts/*midpte* ✓ 730 ✓ answer/*antw* (3) **[4]**